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PROPOSED REFERENCE MODELS FOR ATOMIC OXYGEN IN THE TERRESTRIAL ATMOSPHERE

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ABSTRACT

A provisional Atomic Oxygen Reference model has been derived from average monthly ozone profiles and the MSIS-86 reference model atmosphere. The concentrations are presented in tabular form for the altitude range 40 - 130 km.

INTRODUCTION

While atomic oxygen is an important constituent in the terrestrial atmosphere the measurement of the atmospheric concentration profile is extremely difficult /1/. Those measurements that have been reported (see for example Planetary and Space Science, Volume 36, issue #9, 1988) have certainly not suggested any general agreement on the concentration profile and have indicated that the concentration at the peak of the layer, near 100 km, may vary by as much as two orders of magnitude /2/. This apparent difference is illustrated, in Figure 1, for two profiles /3/ that were taken under similar conditions (latitude, season and time of day), albeit separated by approximately half a solar cycle. However, it should be noted that possible interactions between the measuring instruments and the ambient atmosphere could seriously influence the measured concentrations. As the original source of this atomic oxygen must be the dissociation of molecular oxygen in the thermosphere such large variations would require major fluctuations in either the ultra-violet solar flux, or in those processes that control the loss of atomic oxygen. These latter could be either chemistry or transport dominated. While there is general agreement that the atomic oxygen concentration must exhibit some variation, there is much less agreement as to either the magnitude of these variations or a mean atomic oxygen profile. Thus any proposed reference model for atomic oxygen must either include these large, reported, variations or justify some data selection.

The atomic oxygen profile has been measured with a variety of different experimental techniques and each has its limitation.

1. Mass Spectrometers -- The interactions of the atmospheric constituents with the mass spectrometer walls have been discussed extensively by Offermann et al. /1/ but there seems to be general agreement that the cryo-pumped systems are probably the best design for the lower thermosphere. These systems also offer the advantage that all atmospheric constituents are measured at the same time.

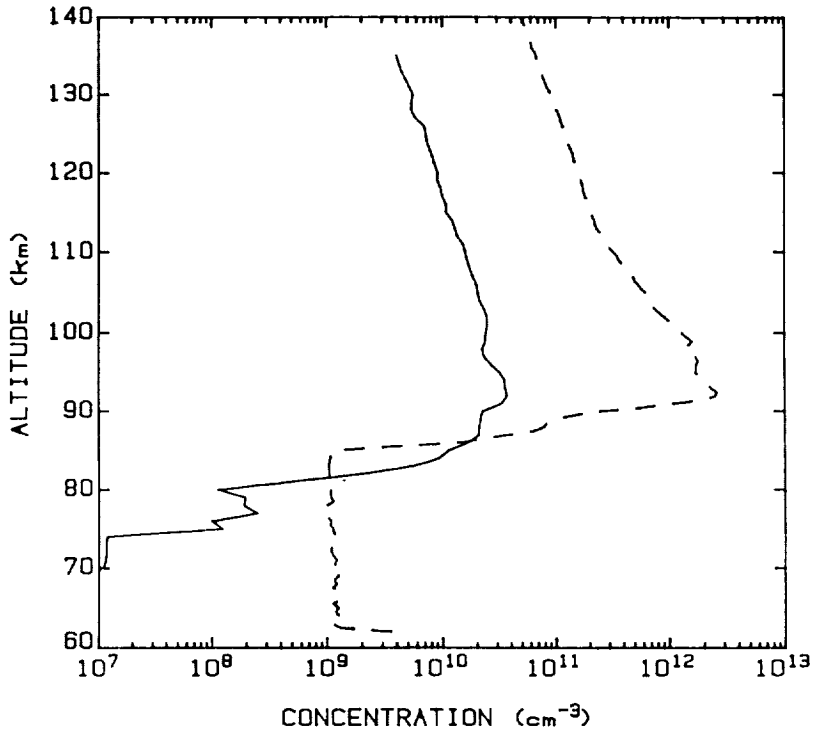

Figure 1. The apparent variation in the measured atomic oxygen concentration height profile for two nighttime profiles taken under similar conditions -- latitude, season, time of day -- but separated by half a solar cycle (P.H.G. Dickinson, private communication).

2. Resonance Lamps -- The details of the scattering appear to be interpreted differently by the various groups /4,5/ using this measurement technique so that the apparent concentrations are quite divergent. Recently there has been some suggestion that interactions between the vehicle and the ambient atmosphere may compromise the measurements /6/.

3. Oxygen recombination emissions -- The details of the oxygen airglow are still uncertain /7/ so that any atomic oxygen determination using these emissions is necessarily limited by the understanding of the airglow excitation process.

4. The OH Meinel emissions -- Recent work by McDade and Llewellyn /8/ has shown that our knowledge of these emissions can be used for atomic oxygen determination but again the accuracy of the derived concentrations are also limited by the knowledge of the airglow processes. However, there have been significant advances since Good /9/ first derived an atomic oxygen profile from the hydroxyl airglow.

5. The quenching of the nitrogen Vegard-Kaplan bands in the aurora -- Although this method has been used for atomic oxygen determination in the aurora there is a requirement for an independent knowledge of the excitation rate of the band system. As with many of the remote sensing methods there is some uncertainty in the appropriate rate constants /10/.

6. The ozone concentration -- The infra-red atmospheric system of oxygen in the airglow can be used to

determine the ozone concentration /11/ and for the assumption that the ozone amounts are in equilibrium it is a simple matter to calculate the atomic oxygen profile /12/. Since the airglow emission is very strong there is little error in the derived atomic oxygen amounts for even strong auroral precipitation.

PROPOSED MODEL

For the mesopause region the available data base for atomic oxygen is somewhat limited. In-situ measurements are necessarily restricted to the locations of available sounding rocket ranges. To overcome this restriction it is believed that the best interim models should concur with the MSIS-86 model /13/. Thus it is proposed that the interim atomic oxygen reference model be a combination of the MSIS-86 model and the atomic oxygen profile derived from the global ozone distribution /14/. It is this combined interim model that is tabulated here. The proposed interim model, for atomic oxygen, makes a smooth transition from the concentrations derived from the global ozone distribution to those of the MSIS-86 model near 100 km. The adopted MSIS-86 atomic oxygen concentrations correspond, in all cases, to quiet solar conditions. The derivation of the atomic oxygen concentration from the ozone concentration follows the technique described by Evans et al. /15/. The calculation of the daytime atomic oxygen profile assumes that the rates of ozone formation and loss may be equated. As the ozone solar dissociation rate, at any altitude, depends on the column concentration of ozone, above that altitude, and the solar elevation angle both factors were included in the determination of the atomic oxygen concentration. For each month the mean solar elevation angle at noon, at that latitude, was used to determine the solar dissociation coefficient. The appropriate atmospheric densities and temperatures were taken from the MAP Reference Atmosphere of Barnett and Corney /16/ and the chemical rate constants were those used by Evans et al. /15/. While the proposed reference model must be considered interim it is expected that with new satellites (e.g. UARS) an improved atomic oxygen reference model should be possible.

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Table 1: Zonally averaged Atomic Oxygen Concentrations (cm^{-3}) in the Southern Hemisphere

[Concentrations shown as 0.0E+00 have not been calculated as either the ozone concentrations are unknown or the atmosphere is in darkness].

January

Latitude	-80	-70	-60	-50	-40	-30	-20	-10
Alt (km)								
130	2.5E+10	2.8E+10	3.1E+10	3.6E+10	3.6E+10	3.7E+10	3.7E+10	3.7E+10
125	3.6E+10	3.9E+10	4.4E+10	5.1E+10	5.1E+10	5.1E+10	5.1E+10	5.0E+10
120	5.4E+10	5.9E+10	6.6E+10	7.6E+10	7.6E+10	7.7E+10	7.5E+10	7.3E+10
115	8.9E+10	9.8E+10	1.1E+11	1.3E+11	1.3E+11	1.3E+11	1.2E+11	1.2E+11
110	1.2E+11	1.4E+11	1.6E+11	1.9E+11	1.9E+11	2.0E+11	2.1E+11	2.2E+11
105	1.7E+11	1.9E+11	2.2E+11	2.8E+11	2.8E+11	3.0E+11	3.2E+11	3.4E+11
100	2.5E+11	2.6E+11	2.9E+11	3.7E+11	3.7E+11	4.0E+11	4.2E+11	4.2E+11
95	3.0E+11	3.0E+11	3.2E+11	3.8E+11	3.8E+11	4.0E+11	4.0E+11	3.9E+11
90	2.4E+11	2.3E+11	2.2E+11	2.4E+11	2.4E+11	2.3E+11	2.2E+11	2.1E+11
85	9.1E+10	8.1E+10	7.3E+10	6.5E+10	6.5E+10	5.8E+10	5.2E+10	4.6E+10
80	4.3E+09	4.5E+09	5.0E+09	7.5E+09	1.1E+10	1.5E+10	1.9E+10	2.1E+10
75	4.9E+09	4.4E+09	4.1E+09	4.2E+09	4.3E+09	4.6E+09	5.2E+09	5.2E+09
70	6.3E+09	5.9E+09	5.6E+09	5.2E+09	4.6E+09	4.1E+09	4.2E+09	4.5E+09
65	7.2E+09	7.0E+09	6.8E+09	6.2E+09	5.8E+09	5.7E+09	5.9E+09	6.1E+09
60	6.4E+09	6.6E+09	6.8E+09	6.8E+09	6.8E+09	6.9E+09	7.2E+09	7.3E+09
55	4.8E+09	5.2E+09	5.6E+09	5.9E+09	6.1E+09	6.3E+09	6.5E+09	6.7E+09
50	3.0E+09	2.8E+09	3.7E+09	4.0E+09	4.3E+09	4.6E+09	4.7E+09	4.8E+09
45	1.2E+09	1.4E+09	1.6E+09	1.8E+09	2.0E+09	2.2E+09	2.3E+09	2.3E+09
40	2.9E+08	3.9E+08	4.6E+08	5.2E+08	5.8E+08	6.1E+08	6.3E+08	6.4E+08

February

Latitude	-80	-70	-60	-50	-40	-30	-20	-10
Alt (km)								
130	2.7E+10	3.0E+10	3.3E+10	3.6E+10	3.8E+10	3.9E+10	3.8E+10	3.7E+10
125	3.8E+10	4.2E+10	4.6E+10	5.1E+10	5.3E+10	5.3E+10	5.2E+10	5.1E+10
120	5.8E+10	6.3E+10	6.9E+10	7.5E+10	7.8E+10	7.8E+10	7.6E+10	7.4E+10
115	9.3E+10	1.0E+11	1.1E+11	1.2E+11	1.3E+11	1.3E+11	1.2E+11	1.2E+11
110	1.3E+11	1.4E+11	1.6E+11	1.8E+11	1.9E+11	2.0E+11	2.1E+11	2.2E+11
105	1.9E+11	2.0E+11	2.3E+11	2.5E+11	2.8E+11	3.0E+11	3.2E+11	3.3E+11
100	2.6E+11	2.7E+11	3.0E+11	3.3E+11	3.7E+11	3.9E+11	4.1E+11	4.0E+11
95	3.0E+11	3.1E+11	3.2E+11	3.4E+11	3.7E+11	3.8E+11	3.8E+11	3.7E+11
90	2.2E+11	2.2E+11	2.1E+11	2.2E+11	2.2E+11	2.2E+11	2.1E+11	2.0E+11
85	7.2E+10	6.8E+10	6.4E+10	6.2E+10	5.8E+10	5.3E+10	4.8E+10	4.3E+10
80	5.0E+09	5.2E+09	6.4E+09	8.9E+09	1.3E+10	1.8E+10	2.2E+10	2.2E+10
75	5.0E+09	3.5E+09	4.6E+09	4.6E+09	4.5E+09	5.2E+09	5.2E+09	5.4E+09
70	6.1E+09	4.6E+09	5.8E+09	5.3E+09	4.9E+09	4.5E+09	4.6E+09	4.6E+09
65	7.4E+09	5.6E+09	6.6E+09	6.2E+09	5.9E+09	5.9E+09	6.1E+09	6.0E+09
60	6.9E+09	5.8E+09	6.7E+09	6.6E+09	6.8E+09	6.9E+09	7.0E+09	7.0E+09
55	5.2E+09	4.8E+09	5.7E+09	5.8E+09	6.0E+09	6.2E+09	6.2E+09	6.5E+09
50	3.2E+09	3.3E+09	3.8E+09	4.1E+09	4.4E+09	4.6E+09	4.7E+09	4.8E+09
45	1.1E+09	1.4E+09	1.6E+09	1.8E+09	2.0E+09	2.2E+09	2.3E+09	2.4E+09
40	2.7E+08	3.6E+08	4.3E+08	4.8E+08	5.4E+08	5.9E+08	6.4E+08	6.8E+08

Table 1: continued

March

Latitude	-80	-70	-60	-50	-40	-30	-20	-10
Alt (km)								
130	3.1E+10	3.3E+10	3.7E+10	4.0E+10	4.1E+10	4.1E+10	4.0E+10	3.9E+10
125	4.3E+10	4.6E+10	5.1E+10	5.5E+10	5.7E+10	5.6E+10	5.5E+10	5.3E+10
120	6.3E+10	6.8E+10	7.4E+10	8.0E+10	8.2E+10	8.2E+10	7.9E+10	7.6E+10
115	1.0E+11	1.1E+11	1.2E+11	1.3E+11	1.3E+11	1.3E+11	1.3E+11	1.2E+11
110	1.4E+11	1.6E+11	1.7E+11	1.9E+11	2.0E+11	2.1E+11	2.1E+11	2.2E+11
105	2.1E+11	2.2E+11	2.4E+11	2.7E+11	2.9E+11	3.1E+11	3.2E+11	3.3E+11
100	2.8E+11	2.9E+11	3.2E+11	3.5E+11	3.8E+11	4.0E+11	4.0E+11	4.0E+11
95	3.0E+11	3.1E+11	3.2E+11	3.5E+11	3.7E+11	3.7E+11	3.7E+11	3.6E+11
90	1.9E+11	2.0E+11	2.0E+11	2.1E+11	2.1E+11	2.1E+11	2.0E+11	2.0E+11
85	5.2E+10	5.3E+10	5.3E+10	5.3E+10	5.1E+10	4.9E+10	4.6E+10	4.2E+10
80	9.8E+09	1.5E+10	1.6E+10	1.9E+10	2.3E+10	2.5E+10	2.3E+10	2.1E+10
75	6.9E+09	6.2E+09	5.8E+09	5.7E+09	5.9E+09	5.8E+09	5.6E+09	5.4E+09
70	6.5E+09	6.3E+09	5.9E+09	5.2E+09	4.9E+09	5.0E+09	4.9E+09	4.7E+09
65	7.2E+09	6.7E+09	6.3E+09	5.9E+09	5.8E+09	6.1E+09	6.2E+09	6.1E+09
60	7.0E+09	6.7E+09	6.6E+09	6.4E+09	6.4E+09	6.6E+09	6.7E+09	6.8E+09
55	5.6E+09	5.2E+09	5.7E+09	5.8E+09	6.0E+09	6.0E+09	6.1E+09	6.4E+09
50	3.5E+09	4.1E+09	4.2E+09	4.4E+09	4.5E+09	4.6E+09	4.6E+09	4.7E+09
45	1.0E+09	1.4E+09	1.7E+09	1.9E+09	2.0E+09	2.2E+09	2.4E+09	2.3E+09
40	2.0E+08	3.0E+08	3.8E+08	4.5E+08	5.1E+08	5.6E+08	6.3E+08	6.7E+08

April

Latitude	-80	-70	-60	-50	-40	-30	-20	-10
Alt (km)								
130	3.4E+10	3.6E+10	3.9E+10	4.1E+10	4.3E+10	4.2E+10	4.1E+10	3.9E+10
125	4.6E+10	4.9E+10	5.3E+10	5.6E+10	5.8E+10	5.7E+10	5.5E+10	5.3E+10
120	6.7E+10	7.1E+10	7.7E+10	8.2E+10	8.4E+10	8.2E+10	7.9E+10	7.6E+10
115	1.0E+11	1.1E+11	1.2E+11	1.3E+11	1.3E+11	1.3E+11	1.3E+11	1.2E+11
110	1.5E+11	1.6E+11	1.8E+11	1.9E+11	2.0E+11	2.1E+11	2.2E+11	2.2E+11
105	2.2E+11	2.3E+11	2.5E+11	2.8E+11	3.0E+11	3.2E+11	3.3E+11	3.3E+11
100	2.9E+11	3.0E+11	3.3E+11	3.6E+11	3.8E+11	4.0E+11	4.0E+11	4.0E+11
95	2.8E+11	3.0E+11	3.2E+11	3.4E+11	3.6E+11	3.7E+11	3.7E+11	3.6E+11
90	1.6E+11	1.7E+11	1.8E+11	1.9E+11	2.0E+11	2.0E+11	2.0E+11	2.0E+11
85	3.7E+10	3.9E+10	4.2E+10	4.5E+10	4.6E+10	4.6E+10	4.5E+10	4.2E+10
80	0.0E+00	0.0E+00	3.0E+10	3.2E+10	3.1E+10	2.7E+10	2.3E+10	2.5E+10
75	0.0E+00	0.0E+00	1.6E+10	1.1E+10	7.8E+09	6.2E+09	5.7E+09	5.5E+09
70	0.0E+00	0.0E+00	8.2E+09	5.8E+09	5.3E+09	2.7E+07	5.0E+09	4.6E+09
65	0.0E+00	0.0E+00	7.4E+09	6.6E+09	6.3E+09	6.5E+09	6.3E+09	5.9E+09
60	0.0E+00	0.0E+00	7.3E+09	6.9E+09	6.6E+09	6.7E+09	6.8E+09	6.7E+09
55	0.0E+00	0.0E+00	6.6E+09	6.4E+09	6.1E+09	6.1E+09	6.2E+09	6.4E+09
50	3.0E+09	5.2E+09	4.5E+09	4.5E+09	4.7E+09	4.6E+09	4.6E+09	4.7E+09
45	6.1E+08	1.4E+09	1.6E+09	1.8E+09	2.0E+09	2.1E+09	2.2E+09	2.2E+09
40	1.1E+08	2.4E+08	3.1E+08	3.7E+08	4.3E+08	4.0E+08	5.6E+08	6.2E+08

Table 1: continued

May

Latitude	-80	-70	-60	-50	-40	-30	-20	-10
Alt (km)								
130	3.3E+10	3.5E+10	3.8E+10	4.0E+10	4.1E+10	4.0E+10	3.9E+10	3.7E+10
125	4.6E+10	4.8E+10	5.2E+10	5.4E+10	5.6E+10	5.5E+10	5.2E+10	5.0E+10
120	6.6E+10	7.0E+10	7.4E+10	7.8E+10	8.0E+10	7.8E+10	7.5E+10	7.2E+10
115	1.0E+11	1.1E+11	1.1E+11	1.2E+11	1.2E+11	1.2E+11	1.2E+11	1.2E+11
110	1.5E+11	1.6E+11	1.8E+11	1.9E+11	2.0E+11	2.0E+11	2.1E+11	2.1E+11
105	2.2E+11	2.3E+11	2.5E+11	2.8E+11	3.0E+11	3.1E+11	3.2E+11	3.2E+11
100	2.7E+11	2.9E+11	3.2E+11	3.5E+11	3.7E+11	3.9E+11	3.9E+11	3.9E+11
95	2.5E+11	2.7E+11	3.0E+11	3.3E+11	3.5E+11	3.6E+11	3.6E+11	3.6E+11
90	1.3E+11	1.4E+11	1.6E+11	1.7E+11	1.9E+11	1.9E+11	2.0E+11	2.0E+11
85	2.8E+10	3.1E+10	3.4E+10	3.9E+10	4.3E+10	4.5E+10	4.6E+10	4.3E+10
80	0.0E+00	0.0E+00	0.0E+00	3.7E+10	3.1E+10	2.8E+10	6.9E+10	3.2E+10
75	0.0E+00	0.0E+00	0.0E+00	1.4E+10	9.1E+09	6.8E+09	6.1E+09	3.8E+09
70	0.0E+00	0.0E+00	0.0E+00	7.8E+09	5.8E+09	5.4E+09	4.8E+09	4.3E+09
65	0.0E+00	0.0E+00	0.0E+00	7.2E+09	7.0E+09	6.5E+09	6.3E+09	5.9E+09
60	0.0E+00	0.0E+00	0.0E+00	5.9E+09	7.0E+09	6.8E+09	7.0E+09	7.0E+09
55	0.0E+00	0.0E+00	0.0E+00	7.4E+09	6.4E+09	6.0E+09	6.2E+09	6.5E+09
50	0.0E+00	3.4E+09	5.4E+09	4.4E+09	4.5E+09	1.2E+11	8.9E+10	4.5E+09
45	0.0E+00	6.8E+08	1.4E+09	1.5E+09	1.8E+09	2.3E+09	2.4E+09	2.0E+09
40	0.0E+00	1.3E+08	2.4E+08	2.9E+08	3.5E+08	4.6E+08	5.4E+08	5.5E+08

June

Latitude	-80	-70	-60	-50	-40	-30	-20	-10
Alt (km)								
130	3.2E+10	3.3E+10	3.5E+10	3.7E+10	3.8E+10	3.7E+10	3.6E+10	3.4E+10
125	4.4E+10	4.6E+10	4.9E+10	5.1E+10	5.2E+10	5.1E+10	4.9E+10	4.6E+10
120	6.3E+10	6.6E+10	7.0E+10	7.4E+10	7.5E+10	7.3E+10	7.0E+10	6.6E+10
115	9.8E+10	1.0E+11	1.1E+11	1.1E+11	1.2E+11	1.1E+11	1.1E+11	1.1E+11
110	1.5E+11	1.6E+11	1.7E+11	1.8E+11	1.9E+11	1.9E+11	2.0E+11	2.0E+11
105	2.1E+11	2.2E+11	2.5E+11	2.7E+11	2.8E+11	3.0E+11	3.0E+11	3.0E+11
100	2.6E+11	2.8E+11	3.1E+11	3.4E+11	3.6E+11	3.7E+11	3.8E+11	3.7E+11
95	2.3E+11	2.5E+11	2.8E+11	3.1E+11	3.4E+11	3.5E+11	3.5E+11	3.5E+11
90	1.2E+11	1.3E+11	1.4E+11	1.6E+11	1.8E+11	1.9E+11	1.9E+11	1.9E+11
85	2.4E+10	2.7E+10	3.0E+10	3.6E+10	4.1E+10	4.5E+10	4.6E+10	4.4E+10
80	0.0E+00	0.0E+00	0.0E+00	0.0E+00	3.1E+10	2.6E+10	2.4E+10	2.5E+10
75	0.0E+00	0.0E+00	0.0E+00	0.0E+00	9.4E+09	6.8E+09	5.7E+09	5.1E+09
70	0.0E+00	0.0E+00	0.0E+00	0.0E+00	6.4E+09	5.7E+09	4.7E+09	4.2E+09
65	0.0E+00	0.0E+00	0.0E+00	0.0E+00	7.7E+09	6.5E+09	6.1E+09	6.0E+09
60	0.0E+00	0.0E+00	0.0E+00	0.0E+00	7.4E+09	7.0E+09	7.0E+09	7.2E+09
55	0.0E+00	0.0E+00	0.0E+00	0.0E+00	6.5E+09	5.9E+09	6.1E+09	6.4E+09
50	0.0E+00	0.0E+00	4.4E+09	5.4E+09	4.4E+09	4.3E+09	4.4E+09	4.5E+09
45	0.0E+00	0.0E+00	9.9E+08	1.5E+09	1.6E+09	1.7E+09	1.8E+09	1.9E+09
40	0.0E+00	0.0E+00	2.1E+08	2.6E+08	3.0E+08	3.7E+08	4.4E+08	5.0E+08

Table 1: continued

July

Latitude	-80	-70	-60	-50	-40	-30	-20	-10
Alt (km)								
130	3.1E+10	3.3E+10	3.5E+10	3.6E+10	3.7E+10	3.6E+10	3.5E+10	3.3E+10
125	4.3E+10	4.5E+10	4.8E+10	5.0E+10	5.1E+10	5.0E+10	4.7E+10	4.5E+10
120	6.2E+10	6.5E+10	6.9E+10	7.2E+10	7.3E+10	7.1E+10	6.8E+10	6.5E+10
115	9.7E+10	1.0E+11	1.1E+11	1.1E+11	1.1E+11	1.1E+11	1.1E+11	1.1E+11
110	1.5E+11	1.5E+11	1.7E+11	1.8E+11	1.9E+11	1.9E+11	1.9E+11	1.9E+11
105	2.1E+11	2.2E+11	2.4E+11	2.6E+11	2.8E+11	2.9E+11	3.0E+11	3.0E+11
100	2.6E+11	2.8E+11	3.1E+11	3.3E+11	3.6E+11	3.7E+11	3.7E+11	3.7E+11
95	2.3E+11	2.5E+11	2.8E+11	3.1E+11	3.3E+11	3.4E+11	3.4E+11	3.4E+11
90	1.2E+11	1.3E+11	1.5E+11	1.6E+11	1.8E+11	1.9E+11	1.9E+11	1.9E+11
85	2.5E+10	2.7E+10	3.1E+10	3.6E+10	4.1E+10	4.4E+10	4.5E+10	4.3E+10
80	0.0E+00	0.0E+00	0.0E+00	2.5E+10	2.5E+10	2.5E+10	2.3E+10	2.1E+10
75	0.0E+00	0.0E+00	0.0E+00	1.2E+10	8.8E+09	6.6E+09	5.5E+09	4.9E+09
70	0.0E+00	0.0E+00	0.0E+00	7.6E+09	5.8E+09	5.4E+09	4.6E+09	4.4E+09
65	0.0E+00	0.0E+00	0.0E+00	7.9E+09	7.1E+09	6.4E+09	6.1E+09	6.0E+09
60	0.0E+00	0.0E+00	0.0E+00	0.0E+00	6.9E+09	6.7E+09	6.8E+09	7.1E+09
55	0.0E+00	0.0E+00	0.0E+00	0.0E+00	6.1E+09	5.9E+09	6.1E+09	6.4E+09
50	0.0E+00	0.0E+00	3.8E+09	4.8E+09	4.1E+09	4.3E+09	4.4E+09	4.6E+09
45	0.0E+00	0.0E+00	8.8E+08	1.4E+09	1.5E+09	1.6E+09	3.9E+08	2.0E+09
40	0.0E+00	0.0E+00	1.8E+08	2.6E+08	2.9E+08	3.6E+08	3.3E+08	4.8E+08

August

Latitude	-80	-70	-60	-50	-40	-30	-20	-10
Alt (km)								
130	3.2E+10	3.4E+10	3.6E+10	3.8E+10	3.9E+10	3.8E+10	3.7E+10	3.5E+10
125	4.4E+10	4.6E+10	5.0E+10	5.2E+10	5.3E+10	5.2E+10	5.0E+10	4.7E+10
120	6.4E+10	6.7E+10	7.2E+10	7.6E+10	7.7E+10	7.5E+10	7.2E+10	6.8E+10
115	1.0E+11	1.0E+11	1.1E+11	1.2E+11	1.2E+11	1.2E+11	1.1E+11	1.1E+11
110	1.5E+11	1.6E+11	1.7E+11	1.8E+11	1.9E+11	2.0E+11	2.0E+11	2.0E+11
105	2.1E+11	2.3E+11	2.5E+11	2.7E+11	2.9E+11	3.0E+11	3.0E+11	3.1E+11
100	2.7E+11	2.9E+11	3.2E+11	3.4E+11	3.6E+11	3.8E+11	3.8E+11	3.8E+11
95	2.6E+11	2.8E+11	3.0E+11	3.3E+11	3.4E+11	3.5E+11	3.5E+11	3.4E+11
90	1.4E+11	1.5E+11	1.6E+11	1.8E+11	1.9E+11	1.9E+11	1.9E+11	1.9E+11
85	3.1E+10	3.3E+10	3.7E+10	4.1E+10	4.4E+10	4.5E+10	4.5E+10	4.2E+10
80	0.0E+00	0.0E+00	2.9E+10	2.8E+10	2.8E+10	2.6E+10	2.4E+10	2.1E+10
75	0.0E+00	0.0E+00	1.4E+10	1.1E+10	9.2E+09	7.6E+09	6.0E+09	5.3E+09
70	0.0E+00	0.0E+00	8.0E+09	6.6E+09	6.3E+09	5.8E+09	5.0E+09	4.4E+09
65	0.0E+00	0.0E+00	7.4E+09	7.4E+09	7.1E+09	6.3E+09	6.0E+09	6.0E+09
60	0.0E+00	0.0E+00	7.0E+09	6.8E+09	6.6E+09	6.7E+09	6.7E+09	7.0E+09
55	0.0E+00	0.0E+00	5.1E+09	6.0E+09	5.8E+09	6.0E+09	6.2E+09	6.5E+09
50	0.0E+00	1.3E+09	3.2E+09	3.7E+09	4.0E+09	4.3E+09	4.5E+09	4.7E+09
45	0.0E+00	3.0E+08	1.0E+09	1.3E+09	1.5E+09	1.7E+09	2.0E+09	2.1E+09
40	0.0E+00	1.0E+08	2.5E+08	2.9E+08	3.2E+08	3.9E+08	4.7E+08	5.4E+08

Table 1: continued

September

Latitude	-80	-70	-60	-50	-40	-30	-20	-10
Alt (km)								
130	3.3E+10	3.5E+10	3.8E+10	4.1E+10	4.2E+10	4.2E+10	4.0E+10	3.9E+10
125	4.5E+10	4.8E+10	5.2E+10	5.6E+10	5.8E+10	5.7E+10	5.5E+10	5.3E+10
120	6.6E+10	7.1E+10	7.6E+10	8.1E+10	8.3E+10	8.2E+10	7.9E+10	7.5E+10
115	1.0E+11	1.1E+11	1.2E+11	1.3E+11	1.3E+11	1.3E+11	1.3E+11	1.2E+11
110	1.5E+11	1.6E+11	1.8E+11	1.9E+11	2.0E+11	2.1E+11	2.2E+11	2.2E+11
105	2.2E+11	2.3E+11	2.5E+11	2.8E+11	3.0E+11	3.2E+11	3.3E+11	3.3E+11
100	2.9E+11	3.0E+11	3.3E+11	3.6E+11	3.8E+11	4.0E+11	4.1E+11	4.0E+11
95	3.0E+11	3.1E+11	3.3E+11	3.5E+11	3.7E+11	3.7E+11	3.7E+11	3.6E+11
90	1.8E+11	1.8E+11	1.9E+11	2.0E+11	2.1E+11	2.0E+11	2.0E+11	2.0E+11
85	4.3E+10	4.5E+10	4.7E+10	4.9E+10	4.9E+10	4.8E+10	4.6E+10	4.3E+10
80	2.5E+10	2.8E+10	3.1E+10	3.3E+10	3.2E+10	2.9E+10	2.5E+10	2.2E+10
75	1.4E+10	1.6E+10	1.4E+10	1.2E+10	9.4E+09	7.3E+09	6.2E+09	5.5E+09
70	7.8E+09	8.1E+09	7.2E+09	6.7E+09	6.3E+09	5.8E+09	5.2E+09	4.4E+09
65	6.0E+09	7.3E+09	7.3E+09	7.3E+09	6.9E+09	6.1E+09	5.7E+09	5.6E+09
60	0.0E+00	7.0E+09	6.8E+09	6.7E+09	6.6E+09	6.5E+09	6.5E+09	6.7E+09
55	0.0E+00	5.8E+09	5.8E+09	5.8E+09	5.8E+09	6.0E+09	6.1E+09	6.4E+09
50	1.0E+09	3.1E+09	3.7E+09	4.0E+09	4.3E+09	4.5E+09	4.5E+09	4.6E+09
45	2.5E+08	1.0E+09	1.4E+09	1.6E+09	1.8E+09	2.0E+09	2.1E+09	2.2E+09
40	1.1E+08	2.9E+08	3.7E+08	3.7E+08	4.0E+08	4.7E+08	5.4E+08	6.0E+08

October

Latitude	-80	-70	-60	-50	-40	-30	-20	-10
Alt (km)								
130	3.2E+10	3.4E+10	3.8E+10	4.2E+10	4.4E+10	4.4E+10	4.3E+10	4.2E+10
125	4.4E+10	4.8E+10	5.3E+10	5.7E+10	6.0E+10	6.0E+10	5.8E+10	5.7E+10
120	6.6E+10	7.1E+10	7.8E+10	8.4E+10	8.7E+10	8.7E+10	8.4E+10	8.2E+10
115	1.0E+11	1.1E+11	1.2E+11	1.3E+11	1.4E+11	1.4E+11	1.4E+11	1.3E+11
110	1.5E+11	1.6E+11	1.8E+11	2.0E+11	2.1E+11	2.2E+11	2.3E+11	2.4E+11
105	2.1E+11	2.3E+11	2.5E+11	2.8E+11	3.1E+11	3.3E+11	3.5E+11	3.6E+11
100	2.9E+11	3.0E+11	3.3E+11	3.6E+11	4.0E+11	4.2E+11	4.3E+11	4.3E+11
95	3.2E+11	3.3E+11	3.4E+11	3.7E+11	3.9E+11	4.0E+11	4.0E+11	3.9E+11
90	2.2E+11	2.2E+11	2.2E+11	2.2E+11	2.3E+11	2.2E+11	2.1E+11	2.1E+11
85	6.3E+10	6.2E+10	6.0E+10	5.9E+10	5.7E+10	5.3E+10	4.9E+10	4.5E+10
80	1.8E+10	2.4E+10	2.8E+10	2.9E+10	2.8E+10	2.5E+10	2.3E+10	2.4E+10
75	9.1E+09	8.9E+09	9.0E+09	8.8E+09	7.6E+09	6.6E+09	6.2E+09	6.5E+09
70	8.0E+09	7.7E+09	7.7E+09	7.1E+09	6.4E+09	5.6E+09	5.3E+09	4.7E+09
65	7.0E+09	6.9E+09	7.0E+09	6.8E+09	6.4E+09	6.0E+09	5.7E+09	5.3E+09
60	6.8E+09	6.7E+09	6.6E+09	6.6E+09	6.5E+09	6.5E+09	6.4E+09	6.5E+09
55	5.1E+09	5.6E+09	6.2E+09	5.8E+09	5.9E+09	6.0E+09	6.1E+09	6.3E+09
50	2.7E+09	3.6E+09	4.0E+09	4.3E+09	4.5E+09	4.6E+09	4.6E+09	4.7E+09
45	9.9E+08	1.4E+09	1.6E+09	1.9E+09	2.1E+09	2.2E+09	2.2E+09	2.3E+09
40	3.1E+08	4.1E+08	4.3E+08	4.6E+08	5.1E+08	5.5E+08	6.0E+08	6.3E+08

Table 1: continued

November

Latitude	-80	-70	-60	-50	-40	-30	-20	-10
Alt (km)								
130	2.9E+10	3.1E+10	3.5E+10	3.9E+10	4.1E+10	4.2E+10	4.2E+10	4.1E+10
125	4.1E+10	4.4E+10	4.9E+10	5.4E+10	5.7E+10	5.8E+10	5.7E+10	5.7E+10
120	6.1E+10	6.7E+10	7.4E+10	8.1E+10	8.5E+10	8.6E+10	8.4E+10	8.2E+10
115	9.9E+10	1.1E+11	1.2E+11	1.3E+11	1.4E+11	1.4E+11	1.4E+11	1.3E+11
110	1.4E+11	1.5E+11	1.7E+11	1.9E+11	2.1E+11	2.2E+11	2.3E+11	2.4E+11
105	1.9E+11	2.1E+11	2.4E+11	2.7E+11	3.0E+11	3.3E+11	3.5E+11	3.6E+11
100	2.7E+11	2.9E+11	3.1E+11	3.5E+11	4.0E+11	4.3E+11	4.5E+11	4.5E+11
95	3.2E+11	3.2E+11	3.4E+11	3.7E+11	4.0E+11	4.2E+11	4.2E+11	4.1E+11
90	2.5E+11	2.3E+11	2.3E+11	2.4E+11	2.4E+11	2.4E+11	2.3E+11	2.2E+11
85	8.4E+10	7.7E+10	7.1E+10	6.8E+10	6.4E+10	5.8E+10	5.3E+10	4.8E+10
80	6.1E+09	7.4E+09	9.8E+09	1.2E+10	1.6E+10	1.8E+10	2.0E+10	2.4E+10
75	5.7E+09	5.5E+09	5.9E+09	5.5E+09	5.9E+09	5.8E+09	6.0E+09	6.4E+09
70	6.7E+09	6.5E+09	6.4E+09	6.2E+09	5.8E+09	5.4E+09	4.7E+09	4.7E+09
65	6.7E+09	6.6E+09	6.5E+09	6.3E+09	6.0E+09	5.8E+09	5.6E+09	5.4E+09
60	6.6E+09	6.6E+09	6.6E+09	7.2E+09	6.6E+09	6.7E+09	6.6E+09	6.9E+09
55	5.0E+09	5.3E+09	5.7E+09	5.9E+09	6.2E+09	6.2E+09	6.2E+09	6.4E+09
50	2.9E+09	3.4E+09	3.8E+09	4.1E+09	4.4E+09	4.6E+09	4.6E+09	4.6E+09
45	1.1E+09	1.4E+09	1.7E+09	2.0E+09	2.2E+09	2.3E+09	2.3E+09	2.3E+09
40	3.2E+08	4.0E+08	4.6E+08	5.4E+08	6.1E+08	6.4E+08	6.5E+08	6.5E+08

December

Latitude	-80	-70	-60	-50	-40	-30	-20	-10
Alt (km)								
130	2.6E+10	2.8E+10	3.2E+10	3.6E+10	3.8E+10	3.9E+10	3.9E+10	3.9E+10
125	3.7E+10	4.0E+10	4.5E+10	5.0E+10	5.3E+10	5.4E+10	5.3E+10	5.3E+10
120	5.6E+10	6.1E+10	6.9E+10	7.6E+10	8.0E+10	8.0E+10	7.9E+10	7.8E+10
115	9.2E+10	1.0E+11	1.1E+11	1.3E+11	1.3E+11	1.3E+11	1.3E+11	1.3E+11
110	1.3E+11	1.4E+11	1.6E+11	1.9E+11	2.0E+11	2.1E+11	2.2E+11	2.3E+11
105	1.8E+11	2.0E+11	2.3E+11	2.6E+11	2.9E+11	3.2E+11	3.4E+11	3.5E+11
100	2.5E+11	2.7E+11	3.0E+11	3.4E+11	3.8E+11	4.2E+11	4.4E+11	4.4E+11
95	3.1E+11	3.1E+11	3.2E+11	3.6E+11	3.9E+11	4.2E+11	4.2E+11	4.1E+11
90	2.5E+11	2.4E+11	2.3E+11	2.4E+11	2.5E+11	2.4E+11	2.3E+11	2.3E+11
85	9.7E+10	8.5E+10	7.6E+10	7.2E+10	6.8E+10	6.1E+10	5.4E+10	4.8E+10
80	4.6E+09	5.1E+09	5.7E+09	7.8E+09	1.1E+10	1.4E+10	1.8E+10	2.2E+10
75	5.0E+09	4.6E+09	4.8E+09	4.6E+09	4.6E+09	4.6E+09	5.3E+09	5.7E+09
70	6.6E+09	6.3E+09	5.9E+09	5.5E+09	5.3E+09	2.4E+09	4.5E+09	4.8E+09
65	7.1E+09	7.1E+09	6.8E+09	6.5E+09	6.1E+09	6.0E+09	6.1E+09	6.1E+09
60	6.6E+09	6.9E+09	7.0E+09	7.0E+09	6.9E+09	7.2E+09	7.4E+09	7.5E+09
55	4.8E+09	5.2E+09	5.6E+09	6.0E+09	6.2E+09	6.4E+09	6.5E+09	6.8E+09
50	2.9E+09	3.3E+09	3.7E+09	4.0E+09	4.3E+09	4.5E+09	4.7E+09	4.8E+09
45	1.2E+09	1.4E+09	1.7E+09	1.9E+09	2.1E+09	2.2E+09	2.3E+09	2.3E+09
40	3.3E+08	4.0E+08	4.8E+08	5.5E+08	6.1E+08	6.4E+08	6.4E+08	6.3E+08

Table 2: Zonally averaged Atomic Oxygen Concentrations (cm^{-3}) in the Northern Hemisphere

[Concentrations shown as 0.0E+00 have not been calculated as either the ozone concentrations are unknown or the atmosphere is in darkness].

January

Latitude	0	10	20	30	40	50	60	70	80
Alt (km)									
130	3.2E+10	3.1E+10	3.1E+10	3.1E+10	3.0E+10	2.9E+10	2.7E+10	2.6E+10	2.4E+10
125	4.3E+10	4.3E+10	4.3E+10	4.3E+10	4.2E+10	4.1E+10	3.9E+10	3.6E+10	3.4E+10
120	6.3E+10	6.2E+10	6.3E+10	6.4E+10	6.4E+10	6.2E+10	5.9E+10	5.5E+10	5.2E+10
115	1.0E+11	1.0E+11	1.0E+11	1.1E+11	1.1E+11	1.0E+11	9.7E+10	9.0E+10	8.5E+10
110	1.9E+11	1.9E+11	1.8E+11	1.7E+11	1.6E+11	1.5E+11	1.4E+11	1.3E+11	1.2E+11
105	2.9E+11	2.9E+11	2.7E+11	2.5E+11	2.3E+11	2.1E+11	1.9E+11	1.7E+11	1.6E+11
100	3.6E+11	3.6E+11	3.5E+11	3.4E+11	3.1E+11	2.8E+11	2.5E+11	2.4E+11	2.3E+11
95	3.3E+11	3.3E+11	3.4E+11	3.4E+11	3.2E+11	3.0E+11	2.8E+11	2.7E+11	2.8E+11
90	1.9E+11	1.8E+11	1.9E+11	2.0E+11	2.0E+11	2.0E+11	2.0E+11	2.1E+11	2.3E+11
85	3.9E+10	3.9E+10	4.4E+10	4.9E+10	5.5E+10	6.0E+10	6.5E+10	7.4E+10	8.6E+10
80	3.8E+10	2.3E+10	2.4E+10	2.4E+10	2.4E+10	2.9E+10	2.5E+10	0.0E+00	0.0E+00
75	5.2E+09	5.7E+09	7.1E+09	9.7E+09	1.3E+10	1.5E+10	1.4E+10	0.0E+00	0.0E+00
70	4.7E+09	4.5E+09	4.7E+09	5.4E+09	6.3E+09	9.4E+09	1.2E+10	0.0E+00	0.0E+00
65	6.0E+09	5.8E+09	5.8E+09	6.0E+09	7.6E+09	7.6E+09	4.9E+09	0.0E+00	0.0E+00
60	7.2E+09	6.9E+09	6.6E+09	6.4E+09	6.0E+09	7.2E+09	6.4E+09	0.0E+00	0.0E+00
55	6.7E+09	6.5E+09	6.2E+09	5.8E+09	5.5E+09	5.4E+09	0.0E+00	0.0E+00	0.0E+00
50	4.8E+09	4.7E+09	4.4E+09	4.1E+09	3.7E+09	2.8E+09	1.9E+09	0.0E+00	0.0E+00
45	2.3E+09	2.1E+09	2.0E+09	1.7E+09	1.3E+09	8.9E+08	4.5E+08	0.0E+00	0.0E+00
40	6.2E+08	5.6E+08	4.9E+08	4.0E+08	2.9E+08	2.0E+08	1.1E+08	0.0E+00	0.0E+00

February

Latitude	0	10	20	30	40	50	60	70	80
Alt (km)									
130	3.4E+10	3.3E+10	3.3E+10	3.3E+10	3.3E+10	3.1E+10	3.0E+10	2.8E+10	2.7E+10
125	4.6E+10	4.5E+10	4.5E+10	4.6E+10	4.5E+10	4.4E+10	4.1E+10	3.9E+10	3.7E+10
120	6.6E+10	6.6E+10	6.6E+10	6.7E+10	6.7E+10	6.5E+10	6.2E+10	5.8E+10	5.6E+10
115	1.1E+11	1.1E+11	1.1E+11	1.1E+11	1.1E+11	1.1E+11	1.0E+11	9.4E+10	9.0E+10
110	2.0E+11	1.9E+11	1.9E+11	1.8E+11	1.7E+11	1.6E+11	1.5E+11	1.3E+11	1.3E+11
105	3.0E+11	3.0E+11	2.8E+11	2.6E+11	2.4E+11	2.2E+11	2.0E+11	1.9E+11	1.8E+11
100	3.7E+11	3.6E+11	3.6E+11	3.5E+11	3.2E+11	2.9E+11	2.7E+11	2.5E+11	2.5E+11
95	3.4E+11	3.4E+11	3.4E+11	3.4E+11	3.2E+11	3.0E+11	2.9E+11	2.9E+11	2.9E+11
90	1.9E+11	1.8E+11	1.9E+11	1.9E+11	2.0E+11	2.0E+11	2.0E+11	2.0E+11	2.2E+11
85	3.9E+10	3.9E+10	4.3E+10	4.7E+10	5.2E+10	5.5E+10	5.9E+10	6.5E+10	7.1E+10
80	2.3E+10	2.4E+10	2.8E+10	2.8E+10	2.7E+10	2.6E+10	2.4E+10	1.7E+10	0.0E+00
75	5.7E+09	6.0E+09	7.3E+09	9.5E+09	1.4E+10	1.8E+10	1.8E+10	1.5E+10	0.0E+00
70	4.5E+09	4.6E+09	5.0E+09	5.5E+09	6.2E+09	7.8E+09	1.1E+10	1.2E+10	0.0E+00
65	5.9E+09	5.5E+09	5.5E+09	5.7E+09	6.1E+09	7.6E+09	8.2E+09	6.5E+09	0.0E+00
60	6.8E+09	6.6E+09	6.2E+09	6.0E+09	5.7E+09	5.8E+09	6.2E+09	5.6E+09	0.0E+00
55	6.5E+09	6.5E+09	6.1E+09	5.8E+09	5.6E+09	5.4E+09	5.2E+09	2.7E+09	0.0E+00
50	4.8E+09	4.7E+09	4.5E+09	4.3E+09	4.1E+09	3.7E+09	2.8E+09	7.6E+08	0.0E+00
45	2.4E+09	2.2E+09	2.1E+09	1.9E+09	1.6E+09	1.2E+09	7.6E+08	1.9E+08	0.0E+00
40	6.7E+08	6.2E+08	5.5E+08	4.6E+08	3.7E+08	2.7E+08	1.6E+08	7.2E+07	0.0E+00

Table 2: continued

March

Latitude / Alt (km)	0	10	20	30	40	50	60	70	80
130	3.8E+10	3.9E+10	3.9E+10	4.0E+10	3.9E+10	3.8E+10	3.7E+10	3.5E+10	3.5E+10
125	5.2E+10	5.2E+10	5.3E+10	5.4E+10	5.4E+10	5.3E+10	5.1E+10	4.9E+10	4.7E+10
120	7.4E+10	7.5E+10	7.6E+10	7.8E+10	7.8E+10	7.7E+10	7.4E+10	7.1E+10	6.9E+10
115	1.2E+11	1.2E+11	1.2E+11	1.2E+11	1.2E+11	1.2E+11	1.2E+11	1.1E+11	1.1E+11
110	2.2E+11	2.2E+11	2.1E+11	2.0E+11	1.9E+11	1.8E+11	1.7E+11	1.6E+11	1.6E+11
105	3.3E+11	3.3E+11	3.2E+11	3.0E+11	2.8E+11	2.6E+11	2.5E+11	2.3E+11	2.3E+11
100	4.0E+11	4.0E+11	3.9E+11	3.8E+11	3.6E+11	3.4E+11	3.2E+11	3.1E+11	3.0E+11
95	3.6E+11	3.6E+11	3.6E+11	3.6E+11	3.5E+11	3.3E+11	3.2E+11	3.1E+11	3.1E+11
90	2.0E+11	1.9E+11	1.9E+11	2.0E+11	2.0E+11	1.9E+11	1.9E+11	1.9E+11	1.8E+11
85	4.0E+10	4.2E+10	4.5E+10	4.6E+10	4.7E+10	4.7E+10	4.7E+10	4.6E+10	4.6E+10
80	2.0E+10	2.2E+10	2.6E+10	2.9E+10	3.2E+10	3.1E+10	2.8E+10	2.3E+10	1.8E+10
75	5.4E+09	5.9E+09	6.7E+09	8.6E+09	1.2E+10	1.7E+10	2.1E+10	1.9E+10	1.4E+10
70	4.5E+09	4.5E+09	5.1E+09	5.8E+09	6.0E+09	7.2E+09	9.4E+09	1.2E+10	1.1E+10
65	5.8E+09	5.6E+09	5.7E+09	5.8E+09	6.2E+09	6.6E+09	7.0E+09	7.4E+09	6.7E+09
60	6.8E+09	6.6E+09	6.2E+09	6.1E+09	6.1E+09	6.1E+09	5.9E+09	5.9E+09	4.2E+09
55	6.5E+09	6.4E+09	6.2E+09	6.0E+09	5.8E+09	5.7E+09	5.5E+09	5.3E+09	2.2E+09
50	4.8E+09	4.7E+09	4.6E+09	4.5E+09	4.4E+09	4.2E+09	3.9E+09	3.0E+09	7.0E+08
45	2.3E+09	2.3E+09	2.2E+09	2.1E+09	2.0E+09	1.7E+09	1.3E+09	8.1E+08	1.9E+08
40	6.8E+08	6.5E+08	6.0E+08	5.3E+08	4.8E+08	4.0E+08	1.4E+08	1.7E+08	7.4E+07

April

Latitude / Alt (km)	0	10	20	30	40	50	60	70	80
130	3.8E+10	3.8E+10	3.8E+10	3.8E+10	3.7E+10	3.6E+10	3.4E+10	3.2E+10	3.1E+10
125	5.2E+10	5.1E+10	5.2E+10	5.2E+10	5.2E+10	5.0E+10	4.7E+10	4.5E+10	4.3E+10
120	7.4E+10	7.4E+10	7.5E+10	7.6E+10	7.6E+10	7.4E+10	7.0E+10	6.6E+10	6.4E+10
115	1.2E+11	1.2E+11	1.2E+11	1.2E+11	1.2E+11	1.2E+11	1.1E+11	1.1E+11	1.0E+11
110	2.2E+11	2.1E+11	2.0E+11	1.9E+11	1.8E+11	1.7E+11	1.6E+11	1.5E+11	1.4E+11
105	3.3E+11	3.2E+11	3.1E+11	2.9E+11	2.7E+11	2.5E+11	2.3E+11	2.1E+11	2.0E+11
100	3.9E+11	3.9E+11	3.9E+11	3.7E+11	3.5E+11	3.2E+11	3.0E+11	2.8E+11	2.8E+11
95	3.6E+11	3.5E+11	3.6E+11	3.5E+11	3.4E+11	3.2E+11	3.1E+11	3.0E+11	3.1E+11
90	1.9E+11	1.9E+11	1.9E+11	2.0E+11	2.0E+11	2.0E+11	2.0E+11	2.0E+11	2.1E+11
85	3.9E+10	4.1E+10	4.4E+10	4.7E+10	5.0E+10	5.3E+10	5.5E+10	5.8E+10	6.1E+10
80	2.5E+10	2.5E+10	2.6E+10	3.0E+10	3.1E+10	2.9E+10	2.8E+10	2.5E+10	1.8E+10
75	5.5E+09	5.4E+09	6.0E+09	7.5E+09	9.2E+09	1.0E+10	1.2E+10	1.3E+10	1.2E+10
70	4.4E+09	4.7E+09	5.4E+09	5.9E+09	6.2E+09	6.6E+09	8.9E+09	7.8E+09	8.7E+09
65	5.7E+09	5.6E+09	5.9E+09	6.0E+09	6.2E+09	6.4E+09	1.8E+10	6.7E+09	1.9E+10
60	6.7E+09	6.6E+09	6.4E+09	6.4E+09	6.5E+09	6.5E+09	6.4E+09	6.2E+09	6.0E+09
55	6.5E+09	6.4E+09	6.1E+09	6.1E+09	6.1E+09	6.0E+09	5.8E+09	5.6E+09	5.4E+09
50	4.0E+09	4.7E+09	4.3E+09	1.7E+12	4.6E+09	4.3E+09	4.1E+09	3.7E+09	2.8E+09
45	2.2E+09	2.3E+09	2.2E+09	2.2E+09	2.2E+09	2.0E+09	5.1E+09	1.2E+09	2.4E+09
40	6.4E+08	6.5E+08	6.2E+08	5.9E+08	5.8E+08	5.2E+08	4.6E+08	2.8E+08	1.8E+08

Table 2: continued

May

Latitude	0	10	20	30	40	50	60	70	80
Alt (km)									
130	3.6E+10	3.5E+10	3.5E+10	3.5E+10	3.4E+10	3.3E+10	3.1E+10	2.9E+10	2.8E+10
125	4.8E+10	4.8E+10	4.8E+10	4.8E+10	4.8E+10	4.6E+10	4.3E+10	4.1E+10	3.9E+10
120	7.0E+10	6.9E+10	7.0E+10	7.1E+10	7.1E+10	6.9E+10	6.5E+10	6.1E+10	5.8E+10
115	1.1E+11	1.1E+11	1.1E+11	1.2E+11	1.2E+11	1.1E+11	1.1E+11	9.8E+10	9.3E+10
110	2.1E+11	2.0E+11	1.9E+11	1.8E+11	1.8E+11	1.6E+11	1.5E+11	1.4E+11	1.3E+11
105	3.2E+11	3.1E+11	2.9E+11	2.7E+11	2.5E+11	2.3E+11	2.1E+11	1.9E+11	1.8E+11
100	3.8E+11	3.8E+11	3.8E+11	3.6E+11	3.3E+11	3.0E+11	2.7E+11	2.6E+11	2.5E+11
95	3.5E+11	3.5E+11	3.5E+11	3.5E+11	3.4E+11	3.1E+11	2.9E+11	2.9E+11	3.0E+11
90	1.9E+11	1.9E+11	1.9E+11	2.0E+11	2.0E+11	2.0E+11	2.0E+11	2.1E+11	2.3E+11
85	4.0E+10	4.0E+10	4.5E+10	4.9E+10	5.4E+10	5.8E+10	6.3E+10	7.0E+10	7.9E+10
80	3.3E+10	3.0E+10	2.7E+10	2.3E+10	1.9E+10	1.6E+10	1.2E+10	9.9E+09	7.4E+09
75	5.8E+09	5.7E+09	5.7E+09	6.2E+09	5.8E+09	5.9E+09	5.4E+09	5.1E+09	5.3E+09
70	4.5E+09	4.7E+09	5.2E+09	5.2E+09	5.5E+09	5.8E+09	6.0E+09	6.4E+09	6.9E+09
65	5.7E+09	6.0E+09	6.2E+09	6.1E+09	6.1E+09	6.4E+09	6.8E+09	6.8E+09	6.7E+09
60	6.9E+09	6.9E+09	6.8E+09	6.7E+09	6.5E+09	6.7E+09	6.7E+09	6.6E+09	6.5E+09
55	6.5E+09	6.3E+09	6.2E+09	6.2E+09	6.2E+09	6.1E+09	5.9E+09	5.6E+09	5.2E+09
50	4.6E+09	4.6E+09	4.7E+09	4.7E+09	4.5E+09	4.3E+09	4.0E+09	3.6E+09	3.1E+09
45	2.1E+09	2.2E+09	2.2E+09	2.2E+09	2.2E+09	2.0E+09	1.8E+09	1.3E+09	1.1E+09
40	5.9E+08	6.2E+08	6.1E+08	6.0E+08	6.0E+08	5.5E+08	4.7E+08	3.7E+08	2.7E+08

June

Latitude	0	10	20	30	40	50	60	70	80
Alt (km)									
130	3.3E+10	3.2E+10	3.2E+10	3.2E+10	3.1E+10	3.0E+10	2.8E+10	2.6E+10	2.5E+10
125	4.4E+10	4.4E+10	4.4E+10	4.4E+10	4.4E+10	4.2E+10	4.0E+10	3.7E+10	3.5E+10
120	6.4E+10	6.4E+10	6.5E+10	6.6E+10	6.6E+10	6.4E+10	6.0E+10	5.6E+10	5.3E+10
115	1.1E+11	1.1E+11	1.1E+11	1.1E+11	1.1E+11	1.1E+11	9.9E+10	9.2E+10	8.7E+10
110	2.0E+11	1.9E+11	1.8E+11	1.7E+11	1.7E+11	1.6E+11	1.4E+11	1.3E+11	1.2E+11
105	3.0E+11	2.9E+11	2.8E+11	2.6E+11	2.4E+11	2.2E+11	2.0E+11	1.8E+11	1.7E+11
100	3.7E+11	3.6E+11	3.6E+11	3.4E+11	3.2E+11	2.9E+11	2.6E+11	2.4E+11	2.3E+11
95	3.4E+11	3.4E+11	3.4E+11	3.4E+11	3.3E+11	3.0E+11	2.8E+11	2.8E+11	2.9E+11
90	1.9E+11	1.9E+11	1.9E+11	2.0E+11	2.1E+11	2.0E+11	2.0E+11	2.1E+11	2.4E+11
85	4.0E+10	4.0E+10	4.5E+10	5.1E+10	5.7E+10	6.1E+10	6.6E+10	7.6E+10	8.9E+10
80	2.5E+10	2.3E+10	2.0E+10	1.7E+10	1.3E+10	1.2E+11	6.2E+09	4.8E+09	4.4E+09
75	5.1E+09	5.0E+09	5.1E+09	5.1E+09	4.9E+09	5.2E+10	4.5E+09	4.3E+09	4.9E+10
70	4.2E+09	4.4E+09	4.5E+09	4.9E+09	4.9E+09	5.1E+09	5.5E+09	5.9E+09	6.2E+09
65	6.0E+09	6.2E+09	6.4E+09	6.1E+09	6.2E+09	6.7E+09	7.2E+09	7.3E+09	7.2E+09
60	7.3E+09	7.4E+09	7.4E+09	7.1E+09	7.0E+09	7.2E+09	7.2E+09	6.9E+09	6.5E+09
55	6.5E+09	6.4E+09	6.3E+09	6.2E+09	6.1E+09	6.0E+09	5.6E+09	5.3E+09	4.8E+09
50	4.6E+09	4.7E+09	4.7E+09	4.6E+09	4.3E+09	4.1E+09	3.7E+09	3.3E+09	2.9E+09
45	2.1E+09	2.1E+09	2.2E+09	2.2E+09	2.1E+09	1.9E+09	1.7E+09	1.4E+09	1.1E+09
40	5.5E+08	5.8E+08	5.8E+08	5.8E+08	5.6E+08	5.2E+08	4.6E+08	3.8E+08	3.0E+08

Table 2: continued

July

Latitude	0	10	20	30	40	50	60	70	80
Alt (km)									
130	3.2E+10	3.1E+10	3.1E+10	3.1E+10	3.0E+10	2.9E+10	2.7E+10	2.6E+10	2.4E+10
125	4.3E+10	4.3E+10	4.3E+10	4.3E+10	4.2E+10	4.1E+10	3.9E+10	3.6E+10	3.4E+10
120	6.3E+10	6.2E+10	6.3E+10	6.4E+10	6.4E+10	6.2E+10	5.9E+10	5.5E+10	5.2E+10
115	1.0E+11	1.0E+11	1.0E+11	1.1E+11	1.1E+11	1.0E+11	9.7E+10	9.0E+10	8.5E+10
110	1.9E+11	1.9E+11	1.8E+11	1.7E+11	1.6E+11	1.5E+11	1.4E+11	1.3E+11	1.2E+11
105	2.9E+11	2.9E+11	2.7E+11	2.5E+11	2.3E+11	2.1E+11	1.9E+11	1.7E+11	1.6E+11
100	3.6E+11	3.6E+11	3.5E+11	3.4E+11	3.1E+11	2.8E+11	2.5E+11	2.4E+11	2.3E+11
95	3.3E+11	3.3E+11	3.4E+11	3.4E+11	3.2E+11	3.0E+11	2.8E+11	2.7E+11	2.8E+11
90	1.9E+11	1.8E+11	1.9E+11	2.0E+11	2.0E+11	2.0E+11	2.0E+11	2.1E+11	2.3E+11
85	3.9E+10	3.9E+10	4.4E+10	4.9E+10	5.5E+10	6.0E+10	6.5E+10	7.4E+10	8.6E+10
80	2.0E+10	2.0E+10	1.8E+10	1.7E+10	1.3E+10	8.9E+09	5.6E+09	4.6E+09	4.3E+09
75	5.2E+09	5.3E+09	5.3E+09	5.1E+09	4.8E+09	4.8E+09	4.2E+09	4.1E+09	4.7E+09
70	4.4E+09	4.3E+09	4.1E+09	4.3E+09	4.9E+09	5.2E+09	5.3E+09	5.8E+09	6.2E+09
65	6.1E+09	6.3E+09	6.3E+09	6.2E+09	6.3E+09	6.6E+09	7.1E+09	7.5E+09	7.4E+09
60	7.3E+09	7.5E+09	7.5E+09	7.3E+09	7.1E+09	7.2E+09	7.2E+09	7.1E+09	6.6E+09
55	6.6E+09	6.6E+09	6.4E+09	6.3E+09	6.0E+09	5.9E+09	5.6E+09	5.2E+09	4.7E+09
50	4.7E+09	4.7E+09	4.7E+09	4.6E+09	4.4E+09	4.0E+09	3.6E+09	3.3E+09	2.9E+09
45	2.1E+09	2.2E+09	2.2E+09	2.1E+09	2.0E+09	1.8E+09	1.6E+09	1.4E+09	1.1E+09
40	5.5E+08	5.7E+08	5.7E+08	5.5E+08	5.3E+08	4.9E+08	4.3E+08	3.6E+08	2.9E+08

August

Latitude	0	10	20	30	40	50	60	70	80
Alt (km)									
130	3.4E+10	3.3E+10	3.3E+10	3.3E+10	3.3E+10	3.1E+10	3.0E+10	2.8E+10	2.7E+10
125	4.6E+10	4.5E+10	4.5E+10	4.6E+10	4.5E+10	4.4E+10	4.1E+10	3.9E+10	3.7E+10
120	6.6E+10	6.6E+10	6.6E+10	6.7E+10	6.7E+10	6.5E+10	6.2E+10	5.8E+10	5.6E+10
115	1.1E+11	1.1E+11	1.1E+11	1.1E+11	1.1E+11	1.1E+11	1.0E+11	9.4E+10	9.0E+10
110	2.0E+11	1.9E+11	1.9E+11	1.8E+11	1.7E+11	1.6E+11	1.5E+11	1.3E+11	1.3E+11
105	3.0E+11	3.0E+11	2.8E+11	2.6E+11	2.4E+11	2.2E+11	2.0E+11	1.9E+11	1.8E+11
100	3.7E+11	3.6E+11	3.6E+11	3.5E+11	3.2E+11	2.9E+11	2.7E+11	2.5E+11	2.5E+11
95	3.4E+11	3.4E+11	3.4E+11	3.4E+11	3.2E+11	3.0E+11	2.9E+11	2.9E+11	2.9E+11
90	1.9E+11	1.8E+11	1.9E+11	1.9E+11	2.0E+11	2.0E+11	2.0E+11	2.0E+11	2.2E+11
85	3.9E+10	3.9E+10	4.3E+10	4.7E+10	5.2E+10	5.5E+10	5.9E+10	6.5E+10	7.1E+10
80	2.0E+10	3.1E+10	2.1E+10	1.9E+10	1.4E+10	1.0E+10	7.0E+09	5.4E+09	5.4E+09
75	5.1E+09	5.2E+09	5.8E+09	5.5E+09	4.8E+09	4.7E+09	4.4E+09	4.3E+09	4.8E+09
70	4.6E+09	4.8E+09	4.7E+08	4.6E+09	4.8E+09	5.2E+09	5.5E+09	5.6E+09	6.0E+09
65	6.1E+09	6.3E+09	6.1E+09	6.1E+09	6.1E+09	6.2E+09	6.6E+09	7.0E+09	7.2E+09
60	7.1E+09	7.1E+09	7.1E+09	7.0E+09	6.9E+09	6.8E+09	6.8E+09	6.8E+09	6.7E+09
55	6.6E+09	6.5E+09	6.2E+09	6.1E+09	5.9E+09	5.7E+09	5.5E+09	5.3E+09	4.9E+09
50	4.8E+09	4.8E+09	4.7E+09	4.7E+09	4.4E+09	4.1E+09	3.7E+09	3.4E+09	3.0E+09
45	2.3E+09	2.3E+09	2.3E+09	2.2E+09	2.0E+09	1.8E+09	1.6E+09	1.3E+09	1.0E+09
40	5.9E+08	6.0E+08	5.8E+08	5.5E+08	5.1E+08	4.6E+08	4.0E+08	3.3E+08	2.8E+08

Table 2: continued

September

Latitude	0	10	20	30	40	50	60	70	80
Alt (km)									
130	3.8E+10	3.8E+10	3.8E+10	3.8E+10	3.8E+10	3.7E+10	3.5E+10	3.3E+10	3.2E+10
125	5.1E+10	5.1E+10	5.2E+10	5.2E+10	5.2E+10	5.0E+10	4.8E+10	4.6E+10	4.4E+10
120	7.4E+10	7.3E+10	7.5E+10	7.6E+10	7.6E+10	7.4E+10	7.1E+10	6.7E+10	6.5E+10
115	1.2E+11	1.2E+11	1.2E+11	1.2E+11	1.2E+11	1.2E+11	1.1E+11	1.1E+11	1.0E+11
110	2.2E+11	2.1E+11	2.1E+11	2.0E+11	1.9E+11	1.8E+11	1.6E+11	1.5E+11	1.5E+11
105	3.3E+11	3.2E+11	3.1E+11	2.9E+11	2.7E+11	2.5E+11	2.3E+11	2.2E+11	2.1E+11
100	4.0E+11	3.9E+11	3.9E+11	3.8E+11	3.5E+11	3.3E+11	3.1E+11	2.9E+11	2.9E+11
95	3.6E+11	3.6E+11	3.6E+11	3.6E+11	3.5E+11	3.3E+11	3.2E+11	3.1E+11	3.1E+11
90	2.0E+11	1.9E+11	1.9E+11	2.0E+11	2.0E+11	2.0E+11	2.0E+11	2.0E+11	2.0E+11
85	4.0E+10	4.1E+10	4.5E+10	4.7E+10	4.9E+10	5.1E+10	5.3E+10	5.4E+10	5.5E+10
80	2.1E+10	2.0E+10	2.2E+10	2.3E+10	8.6E+12	1.9E+10	1.5E+10	1.5E+10	1.2E+10
75	5.5E+09	5.6E+09	5.7E+09	6.0E+09	6.0E+09	6.1E+09	5.7E+09	6.3E+09	7.5E+09
70	4.3E+09	4.6E+09	4.7E+09	4.6E+09	2.0E+10	4.9E+09	5.4E+09	5.6E+09	6.1E+09
65	5.8E+09	5.8E+09	5.7E+09	5.6E+09	5.5E+09	3.3E+05	5.7E+09	6.0E+09	6.5E+09
60	6.7E+09	6.6E+09	6.7E+09	6.5E+09	6.3E+09	4.0E+08	6.4E+09	6.2E+09	6.1E+09
55	6.4E+09	2.2E+12	6.1E+09	6.0E+09	5.8E+09	3.8E+08	5.5E+09	5.4E+09	5.3E+09
50	4.7E+09	4.8E+09	4.7E+09	4.7E+09	4.9E+09	3.7E+08	4.1E+09	3.8E+09	3.1E+09
45	2.3E+09	2.3E+09	2.3E+09	2.2E+09	2.1E+09	3.0E+08	1.6E+09	1.3E+09	9.0E+08
40	6.4E+08	6.3E+08	6.0E+08	5.4E+08	5.0E+08	1.6E+08	3.6E+08	2.7E+08	1.8E+08

October

Latitude	0	10	20	30	40	50	60	70	80
Alt (km)									
130	4.2E+10	4.2E+10	4.3E+10	4.4E+10	4.4E+10	4.3E+10	4.1E+10	4.0E+10	3.9E+10
125	5.6E+10	5.7E+10	5.8E+10	5.9E+10	6.0E+10	5.9E+10	5.7E+10	5.4E+10	5.3E+10
120	8.0E+10	8.1E+10	8.3E+10	8.5E+10	8.6E+10	8.5E+10	8.2E+10	7.9E+10	7.7E+10
115	1.3E+11	1.3E+11	1.3E+11	1.3E+11	1.3E+11	1.3E+11	1.3E+11	1.2E+11	1.2E+11
110	2.4E+11	2.4E+11	2.3E+11	2.2E+11	2.1E+11	2.0E+11	1.9E+11	1.8E+11	1.8E+11
105	3.6E+11	3.6E+11	3.5E+11	3.3E+11	3.1E+11	2.9E+11	2.7E+11	2.6E+11	2.5E+11
100	4.3E+11	4.3E+11	4.3E+11	4.2E+11	4.0E+11	3.7E+11	3.5E+11	3.4E+11	3.3E+11
95	3.9E+11	3.9E+11	3.9E+11	3.9E+11	3.8E+11	3.6E+11	3.5E+11	3.3E+11	3.2E+11
90	2.1E+11	2.1E+11	2.1E+11	2.1E+11	2.1E+11	2.0E+11	2.0E+11	1.9E+11	1.8E+11
85	4.3E+10	4.6E+10	4.9E+10	4.9E+10	4.9E+10	4.8E+10	4.7E+10	4.5E+10	4.3E+10
80	2.5E+10	2.3E+10	2.1E+10	2.4E+10	2.8E+10	2.8E+10	2.6E+10	2.3E+10	1.6E+10
75	6.6E+09	6.0E+09	6.3E+09	6.6E+09	7.3E+09	9.7E+09	1.4E+10	1.6E+10	1.5E+10
70	4.4E+09	4.4E+09	4.7E+09	4.8E+09	5.1E+09	5.2E+09	7.0E+09	1.0E+10	1.1E+10
65	5.1E+09	5.1E+09	6.1E+09	6.0E+09	6.2E+09	6.3E+09	5.7E+09	7.3E+09	0.0E+00
60	6.5E+09	6.4E+09	6.5E+09	6.3E+09	6.1E+09	6.0E+09	1.0E+10	6.7E+09	0.0E+00
55	6.5E+09	6.4E+09	6.8E+09	6.0E+09	5.9E+09	6.0E+09	6.0E+09	6.0E+09	0.0E+00
50	4.7E+09	4.7E+09	4.6E+09	4.6E+09	4.6E+09	4.5E+09	4.4E+09	3.9E+09	3.1E+09
45	2.3E+09	2.2E+09	2.2E+09	2.1E+09	2.0E+09	1.8E+09	1.5E+09	1.1E+09	6.3E+08
40	6.4E+08	6.2E+08	5.7E+08	5.1E+08	4.5E+08	3.8E+08	3.0E+08	2.0E+08	1.0E+08

Table 2: continued

November

Latitude	0	10	20	30	40	50	60	70	80
Alt (km)									
130	4.2E+10	4.3E+10	4.5E+10	4.6E+10	4.7E+10	4.6E+10	4.6E+10	4.5E+10	4.4E+10
125	5.7E+10	5.8E+10	6.1E+10	6.3E+10	6.4E+10	6.4E+10	6.2E+10	6.1E+10	6.0E+10
120	8.2E+10	8.4E+10	8.7E+10	9.0E+10	9.2E+10	9.2E+10	9.0E+10	8.8E+10	8.6E+10
115	1.3E+11	1.4E+11	1.4E+11	1.4E+11	1.4E+11	1.4E+11	1.4E+11	1.4E+11	1.3E+11
110	2.5E+11	2.5E+11	2.4E+11	2.4E+11	2.3E+11	2.2E+11	2.1E+11	2.0E+11	2.0E+11
105	3.7E+11	3.7E+11	3.7E+11	3.5E+11	3.4E+11	3.2E+11	3.0E+11	2.9E+11	2.8E+11
100	4.5E+11	4.5E+11	4.6E+11	4.5E+11	4.3E+11	4.1E+11	3.9E+11	3.7E+11	3.5E+11
95	4.1E+11	4.1E+11	4.2E+11	4.1E+11	4.0E+11	3.8E+11	3.6E+11	3.4E+11	3.2E+11
90	2.3E+11	2.3E+11	2.3E+11	2.2E+11	2.2E+11	2.1E+11	1.9E+11	1.8E+11	1.7E+11
85	4.6E+10	5.0E+10	5.3E+10	5.2E+10	5.0E+10	4.6E+10	4.2E+10	3.8E+10	3.6E+10
80	2.8E+10	2.9E+10	2.6E+08	2.9E+10	3.2E+10	3.3E+10	2.9E+10	0.0E+00	0.0E+00
75	6.6E+09	6.5E+09	6.8E+09	8.3E+09	9.9E+09	1.4E+10	1.6E+10	0.0E+00	0.0E+00
70	4.4E+09	4.3E+09	4.5E+09	5.3E+09	6.1E+09	7.7E+09	1.1E+10	0.0E+00	0.0E+00
65	5.2E+09	5.3E+09	5.9E+09	6.6E+09	6.9E+09	7.4E+09	8.1E+09	0.0E+00	0.0E+00
60	6.8E+09	6.7E+09	6.3E+09	6.5E+09	6.2E+09	6.3E+09	7.3E+09	0.0E+00	0.0E+00
55	6.6E+09	6.5E+09	5.9E+09	6.1E+09	6.1E+09	6.2E+09	0.0E+00	0.0E+00	0.0E+00
50	4.7E+09	4.5E+09	4.1E+09	4.5E+09	4.4E+09	4.5E+09	4.4E+09	3.0E+09	0.0E+00
45	2.2E+09	2.1E+09	2.0E+09	2.0E+09	1.9E+09	1.6E+09	1.2E+09	6.0E+08	0.0E+00
40	6.3E+08	5.8E+08	5.3E+08	4.7E+08	3.9E+08	3.1E+08	2.2E+08	1.1E+08	0.0E+00

December

Latitude	0	10	20	30	40	50	60	70	80
Alt (km)									
130	3.9E+10	4.1E+10	4.3E+10	4.5E+10	4.6E+10	4.6E+10	4.6E+10	4.5E+10	4.5E+10
125	5.4E+10	5.6E+10	5.9E+10	6.1E+10	6.3E+10	6.3E+10	6.3E+10	6.2E+10	6.1E+10
120	7.8E+10	8.0E+10	8.4E+10	8.8E+10	9.0E+10	9.1E+10	9.0E+10	8.9E+10	8.8E+10
115	1.3E+11	1.3E+11	1.3E+11	1.4E+11	1.4E+11	1.4E+11	1.4E+11	1.4E+11	1.4E+11
110	2.4E+11	2.4E+11	2.4E+11	2.3E+11	2.3E+11	2.2E+11	2.1E+11	2.1E+11	2.0E+11
105	3.6E+11	3.7E+11	3.6E+11	3.6E+11	3.4E+11	3.3E+11	3.1E+11	3.0E+11	2.9E+11
100	4.4E+11	4.5E+11	4.6E+11	4.5E+11	4.3E+11	4.1E+11	3.9E+11	3.7E+11	3.5E+11
95	4.1E+11	4.2E+11	4.2E+11	4.2E+11	4.0E+11	3.8E+11	3.6E+11	3.3E+11	3.1E+11
90	2.3E+11	2.3E+11	2.3E+11	2.3E+11	2.2E+11	2.0E+11	1.8E+11	1.7E+11	1.6E+11
85	4.8E+10	5.2E+10	5.5E+10	5.3E+10	4.9E+10	4.4E+10	3.8E+10	3.5E+10	3.2E+10
80	2.3E+10	2.4E+10	2.5E+10	2.6E+10	3.1E+10	3.3E+10	0.0E+00	0.0E+00	0.0E+00
75	5.8E+09	5.9E+09	6.8E+09	9.0E+09	1.2E+10	1.6E+10	0.0E+00	0.0E+00	0.0E+00
70	4.6E+09	4.4E+09	4.7E+09	5.8E+09	7.2E+09	1.0E+10	0.0E+00	0.0E+00	0.0E+00
65	5.9E+09	5.8E+09	5.8E+09	2.0E+10	8.1E+09	8.6E+09	0.0E+00	0.0E+00	0.0E+00
60	7.4E+09	7.2E+09	6.9E+09	6.8E+09	6.3E+09	8.1E+09	0.0E+00	0.0E+00	0.0E+00
55	6.9E+09	6.7E+09	6.2E+09	5.8E+09	5.7E+09	6.6E+09	0.0E+00	0.0E+00	0.0E+00
50	4.8E+09	4.6E+09	4.3E+09	4.1E+09	3.8E+09	3.4E+09	3.2E+09	0.0E+00	0.0E+00
45	2.2E+09	2.1E+09	1.9E+09	1.7E+09	1.5E+09	1.1E+09	7.1E+08	0.0E+00	0.0E+00
40	6.0E+08	5.5E+08	5.0E+08	4.2E+08	3.2E+08	2.2E+08	1.3E+08	0.0E+00	0.0E+00